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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Status

1) ☒ Responsive to communication(s) filed on *14 November 2005*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-10 and 14-21* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-10 and 14-21* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *15 October 2003* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

DETAILED ACTION

1.   Claims 1-10 and 14-21 are pending and have been examined.

2.   Claims 1-10 and 14-21 are rejected.

Response to Arguments

3.   Applicant's arguments, see pages 9-13, filed November 14, 2005, with respect to the

rejection(s) of claim(s) 1-3, 6-7, 9-12, 14 and 17-20 under 35 U.S.C. §102(b) have been fully

considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon

further consideration, a new ground(s) of rejection is made in view of Chen et al. (US

20040148450A1).

Allowable Subject Matter

4.   The indicated allowability of claims 4-5, 13 and 21 is withdrawn in view of the newly

discovered reference(s) to Chen et al.. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 112

5.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
> subject matter which the applicant regards as his invention.

6.   Claims 10 and 14-16 rejected under 35 U.S.C. 112, second paragraph, as being indefinite

for failing to particularly point out and distinctly claim the subject matter which applicant

regards as the invention. It is unclear from applicant's claimed invention how the "flash

controller" and "flash memory" are connected and where they are placed. Claim 10 first states

that the "flash memory" is connected to the "flash controller" which is connected to the second

device port of the hub controller mounted on the PCB substrate. Claim 10 later states that both

the "flash controller" and the "flash memory" are mounted on a daughter-card. The Examiner

believes that applicant's intent is to claim that there exists a "flash controller" and "flash

memory" on both the PCB substrate and the daughter-card, in other words the PCB substrate and

daughter-card are identical structures that serially connect to each other.

Claim Rejections - 35 USC § 102

7.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
> in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
> patent by another filed in the United States before the invention by the applicant for patent, except that an
> international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
> subsection of an application filed in the United States only if the international application designated the United
> States and was published under Article 21(2) of such treaty in the English language.

8.   Claims 1-7, 9-10, 14 and 17-21 rejected under 35 U.S.C. 102(e) as being anticipated by

Chen et al. (US 20040148450A1).

Regarding claim 1, a chainable Universal-Serial-Bus (USB) flash-memory drive comprising:

- a drive substrate having wiring traces for electrically connecting components (While

    Chen does not explicitly state that the various components of the USB drive of figures 1

    and 2 are mounted on a drive substrate having wiring traces for electrically connecting

    components there **must** inherently be wiring traces for electrically connecting

    components);

- a USB hub, mounted on the drive substrate, having a host port and a plurality of device ports (Fig. 2, item 2; [0015,0018-0019]);

- a male USB connector mounted on the drive substrate, connected by the wiring traces to the USB hub (Fig. 1 & 2, item 11; [0015-0016]);

- a female USB connector mounted on the drive substrate, connected by the wiring traces to the USB hub (Fig. 1 & 2, item 12; [0015-0016]);

- a flash controller mounted on the drive substrate, connected by the wiring traces to one of the plurality of device ports of the USB hub (Fig. 2, item 3; [0015-0018]); and

- a flash memory mounted on the drive substrate, connected by the wiring traces to the flash controller, for storing data received by the USB hub through the host port (Fig. 2, item 4; [0015-0019]),

- whereby the drive substrate has mounted thereon the male USB connector, the female USB connector, the USB hub, the flash controller, and the flash memory ([0016]).

Regarding claim 2, the chainable USB flash-memory drive of claim 1 wherein the male USB connector connects to the host port of the USB hub; wherein the female USB connector connects to one of the plurality of device ports of the USB hub (Fig. 2 clearly shows the male port 11 connects to the USB HUB 2 and also clearly shows the female port 12).

Regarding claim 3, the chainable USB flash-memory drive of claim 2 wherein the female USB connector can connect to the male USB connector of a downstream chainable USB flash-memory drive allowing a host connected to the male USB connector of the chainable USB flash-

memory drive to read flash memory from either the chainable USB flash-memory drive or from

the downstream chainable USB flash-memory drive, whereby the chainable USB flash-memory

drive can be daisy-chained to the downstream chainable USB flash-memory drive [0006, 0018-

0020].

Regarding claim 4, the chainable USB flash-memory drive of claim 3 further comprising: a

daughter-card that has a flash controller and a flash memory mounted thereon; a socket on the

drive substrate, the socket connected to one of the plurality of device ports of the USB hub by

the wiring traces; secondary connectors on the daughter-card for fitting into the socket on the

drive substrate, whereby expansion of flash memory is provided by the daughter-card (Chen

discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may

be serially connected thus providing infinitely many drive substrates connected to each other via

upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention

of Chen plugged into the downstream port 12 represents a daughter-card that has all of the

functional components of the PCB substrate).

Regarding claim 5, the chainable USB flash-memory drive of claim 4 wherein the secondary

connectors on the daughter-card comprise metal contact pads along a long edge or along a short

edge of the daughter-card, or comprise metal posts or a female connector plug (Fig. 1 of Chen

clearly shows USB (metal) contact pads on the short side of the USB drive for connecting to

metal contacts of other serially attached USB drives).

Regarding claim 6, the chainable USB flash-memory drive of claim 3 further comprising: a

daughter-card that has a flash memory mounted thereon; an expansion flash controller mounted

on the drive substrate and connected to one of the plurality of device ports of the USB hub by the

wiring traces; a socket on the drive substrate, the socket connected to the expansion flash

controller by the wiring traces, whereby expansion flash memory is mounted on the daughter-

card but the expansion flash controller is mounted on the drive substrate (Chen discloses [0006,

0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be serially

connected thus providing infinitely many drive substrates connected to each other via upstream

and downstream ports 11 and 12. Therefore any secondary USB drive of the invention of Chen

plugged into the downstream port 12 represents a daughter-card that has all of the functional

components of the PCB substrate).

Regarding 7, the chainable USB flash-memory drive of claim 6 wherein the secondary

connectors on the daughter-card comprise metal contact pads along a long edge or along a short

edge of the daughter-card, or comprise metal posts or a female connector plug (Fig. 1 of Chen

clearly shows USB (metal) contact pads on the short side of the USB drive for connecting to

metal contacts of other serially attached USB drives).

Regarding claim 9, the chainable USB flash-memory drive of claim 3 wherein the male USB

connector and the female USB connector are mounted on opposite edges of the drive substrate

(Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and

2) may be serially connected thus providing infinitely many drive substrates connected to each

other via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the

invention of Chen plugged into the downstream port 12 represents a daughter-card that has all of

the functional components of the PCB substrate).

Regarding claim 10, a daisy-chainable flash card comprising:

- a printed-circuit board (PCB) substrate (Fig. 2);

- a hub controller mounted on the PCB substrate, the hub controller having a host port, a

  first device port, and a second device port, the hub controller forwarding commands and

  data to and from the host port and the first device port or the second device port ([0015-

  0021]);

- a male connector mounted on the PCB substrate and connected to the host port of the hub

  controller for insertion into a female connector on a host (Fig. 1 & 2, item 11; [0015-

  0016]);

- a female connector mounted on the PCB substrate and connected to the first device port

  of the hub controller, for receiving a male connector on a downstream device (Fig. 1 & 2,

  item 12; [0015-0016]);

- a flash controller connected to the second device port of the hub controller (Fig. 2, item 3;

  [0015-0018]); and

- a flash memory connected to the flash controller, for storing data from the host (Fig. 2,

  item 4; [0015-0019]),

- wherein both the flash controller and the flash memory are mounted on a daughter-card;

- a socket on the PCB substrate for receiving a connector on the daughter-card,

- wherein the flash memory is connected to the flash controller which connects to the hub controller through the connector and the socket; (As stated above in the rejection under 35 U.S.C. 112 second paragraph the Examiner believes that applicant's intent is to claim that there exists a "flash controller" and "flash memory" on both the PCB substrate and the daughter-card, in other words the PCB substrate and daughter-card are identical structures that serially connect to each other. Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be serially connected thus providing infinitely many drive substrates connected to each other via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention of Chen plugged into the downstream port 12 represents a daughter-card that has all of the functional components of the PCB substrate)

- wherein the hub controller routes data from the host to the flash controller for storage by the flash memory when the host addresses local flash memory, but the hub controller routes data from the host to the female connector when the host does not address the local flash memory ([0015-0021]).

Regarding claim 14, the daisy-chainable flash card of claim 10 wherein the male connector is a male USB connector, the female connector is a female USB connector, and the hub controller is a USB hub controller [0015-0016].

Regarding claim 17, an expandable flash card comprising:

- substrate means for physically supporting and electrically connecting components mounted thereon (Fig. 1 and 2);

- male protocol connector means, attached to the substrate means, for plugging into a female protocol connector on a host (Fig. 1 &2, item 11; [0015-0016]);

- female protocol connector means, attached to the substrate means, for receiving a male protocol connector on a downstream device (Fig. 1 & 2, item 12; [0015-0016]) ;

- protocol hub controller means, mounted on the substrate means, for routing protocol data from the host to an addressed port in a plurality of ports (Fig. 2, item 2; [0015-0021]);

- first memory means, mounted on the substrate means, for storing the protocol data from the host when the host addresses a port on the protocol hub controller means for the first memory means (Fig. 2, item 4; [0015-0019]); and

- pass-through means for passing the protocol data from the host through to the female protocol connector means when the host addresses a port that is not in the plurality of ports of the protocol hub controller means, whereby protocol data is stored on the first memory means mounted on the substrate means, or is passed through from the male protocol connector means to the female protocol connector means ([0015-0021]; Chen discloses that the switching circuit (i.e. USB Hub) functions as a USB Hub therefore passing signals through the substrate/daughter-card to the appropriate device).

Regarding claim 18, the expandable flash card of claim 17 wherein: when a protocol is a USB

protocol, the male protocol connector means is a male USB connector means, the female

protocol connector means is a female USB connector means, the protocol hub controller means

is a USB hub controller means, and the protocol data is USB data [0015-0016].

Regarding claim 19, the expandable flash card of claim 18 further comprising: socket means,

connected to a second of the plurality of ports of the protocol hub controller means, for receiving

a daughter-card containing a second flash memory means for storing the protocol data from the

host when the host addresses a port on the protocol hub controller means for the second memory

means (Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures

1 and 2) may be serially connected thus providing infinitely many drive substrates connected to

each other via upstream and downstream ports 11 and 12. Therefore any secondary USB drive

of the invention of Chen plugged into the downstream port 12 represents a daughter-card that has

all of the functional components of the PCB substrate.).

Regarding claim 20, the expandable flash card of claim 18 wherein the protocol hub controller

means further comprises address decode means for detecting and decoding protocol addresses

received from the host over protocol data lines ([006, 0019-0020]; Chen discloses that the switch

circuit 2 of Fig. 2 acts as a USB Hub passing data to a standard peripheral device inserted in the

chain of serially connected USB drives. Therefore the switch circuit (i.e. hub controller) **must**

detect and decode addresses associated with peripheral devices attached to the USB drive).

Regarding claim 21,

The expandable flash card of claim 20 further comprising a downstream expandable flash card that comprises:

- downstream substrate means for physically supporting and electrically connecting components mounted thereon (Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be serially connected thus providing infinitely many drive substrates connected to each other via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention.of Chen plugged into the downstream port 12 represents a daughter-card that has all of the functional components of the PCB substrate.);

- downstream male protocol connector means, attached to the downstream substrate means, for plugging into the female protocol connector means (Fig. 2, item 11 plugs into item 12 of an upstream USB drive [0015-0016]);

- downstream female protocol connector means, attached to the downstream substrate means, for receiving a male protocol connector on a further downstream device (Fig. 2, item 12 receives a downstream plug 11 from a serially connected USB drive);

- downstream protocol hub controller means, mounted on the downstream substrate means, for routing protocol data from the host to an addressed port in a second plurality of ports ([006, 0019-0020]; Chen discloses that the switch circuit 2 of Fig. 2 acts as a USB Hub passing data to a standard peripheral device inserted in the chain of serially connected USB drives. Therefore the switch circuit (i.e. hub controller) **must** detect and decode addresses associated with peripheral devices attached to the USB drive);

- downstream first memory means, mounted on the downstream substrate means, for

  storing the protocol data from the host when the host addresses a port on the downstream

  protocol hub controller means for the downstream first memory means (Chen discloses

  [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be

  serially connected thus providing infinitely many drive substrates connected to each other

  via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of

  the invention of Chen plugged into the downstream port 12 represents a daughter-card

  that has all of the functional components of the PCB substrate.); and

- downstream pass-through means for passing the protocol data from the host through to

  the downstream female protocol connector means when the host addresses a port that is

  not in the second plurality of ports of the downstream hub controller means and is not in

  the plurality of ports of the protocol hub controller means ([0015-0021]; Chen discloses

  that the switching circuit (i.e. USB Hub) functions as a USB Hub therefore passing

  signals through the substrate/daughter-card to the appropriate device), wherein the

  downstream expandable flash card is removable from the expandable flash card (Chen

  discloses that the plurality of USB drives are serially and removably connected [0015-

  0021]).

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10.   Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen as applied to claim 3 above, and further in view of what was common knowledge to one of ordinary skill in the art at the time of applicant's invention.

As noted above with respect to claim 3, Chen teaches a chainable USB flash memory comprising a substrate (Fig. 1 and 2) and a downstream expansion board (same as the substrate, *see above*). The substrate contains the necessary hub and controller functions to access the memories of the substrate and expansion modules. **OFFICIAL NOTICE** is taken that it was common knowledge at the time of applicant's invention to implement a PCB as a multi-layer PCB in order to provide more surface area for conductive wiring patterns as evidenced by Crepeau (US 4,249,302) (col. 2, ll. 37-54)..

11.   Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen as applied to claim 10 above, and further in view of the IEEE Standard for a High Performance Serial Bus (i.e. IEEE1394 firewire).

As noted above with respect to claim 10, Chen teaches a chainable PCB USB flash memory comprising a substrate (Fig. 1 and 2) and a downstream expansion board (same as the substrate, *see above*). The substrate contains the necessary hub and controller functions to access the memories of the substrate and expansion modules [0015-0021] along with the necessary

connectors to attach the substrate to the host and the expansion memory modules.   Chen

however fails to teach the USB connectors (Fig. 2, items 11 and 12) may also adhere to the

IEEE-1394 firewire specification.

The firewire specification teaches of a high-speed, low cost serial bus connection that provides:

a) Automatic assignment of node addresses—no need for address switches.

b) Variable speed data transmission based on ISDN-compatible1 bit rates from 24.576 Mbit/s for

TTL backplanes to 49.152 Mbit/s for BTL backplanes to 98.304 Mbit/s, 196.608 Mbit/s, and

393.216 Mbit/s for the cable medium.

c) The cable medium allows up to sixteen physical connections (cable hops), each up to 4.5 m,

giving a total cable distance of 72 m between any two devices. Bus management recognizes

smaller configurations to optimize performance.

d) Bus transactions that include both block and single quadlet reads and writes, as well as an

"isochronous" mode that provides a low-overhead guaranteed bandwidth service.

e) A physical layer supporting both cable media and backplane buses.

f) A fair bus access mechanism that guarantees all nodes equal access. The backplane

environment adds a priority mechanism, but one that ensures that nodes using the fair protocol

are still guaranteed at least partial access.

It would have been obvious to one of ordinary skill in the art at the time of the applicant's

invention to implement the USB connections as IEEE1394 firewire connections since IEEE1394

firewire has the added advantage of architectural compatibility with parallel computer buses; this

leads to lower communications overhead than limited function dedicated I/O interconnects.

12.   Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's

admitted prior art as applied to claim 10 above, and further in view of Chen.

Applicant's admitted prior art (AAPA) teaches non-volatile flash memory is especially useful for

small consumer devices such as digital cameras, music players, personal digital assistants, etc

[0002]. Typically these flash memories are used to expand the storage capacity of a personal

computer (or previously listed applications) [0003]. These flash memories adhere to several well

known connection standards including secure-digital, memory-stick, or compact flash [0003].

However, applicant admits that one shortcoming of such flash memories is the limited capacity

of internal flash memory chips [0006]. Applicant then admits that what is needed is an

expandable flash-memory drive.

As noted above with respect to claim 10, Chen teaches an expandable flash-memory substrate

(Fig. 1 and 2) that comprises a male connector (Fig. 2, 11), a female connector (Fig. 2, 12), a

flash memory controller, and a hub controller (Fig. 2, item 2; [0015,0018-0019]]). Chen also

teaches that slave boards (Fig. 1 and 2) may be connected to the substrate for extending the

memory size of the substrate by the incorporation of additional flash chips ([0007-0008, 0021]).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's

invention to implement the expandable flash memory of Chen into a standard flash memory as

set forth in AAPA (i.e. secure-digital, memory-stick, or compact flash) such that the user is

provided with a flash memory having unlimited memory expansion (Chen; [0007-0008, 0021]).

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13.   Claims 1-7, 9-10, 14 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Pua et al. (US 20020147882A1) in view of Chen et al. (US 20040148450A1).

Regarding claim 1, Pua discloses a chainable Universal-Serial-Bus (USB) flash-memory drive

comprising:

- a drive substrate having wiring traces for electrically connecting components (Fig. 1A,
  100; [0067]);

- a USB hub, mounted on the drive substrate, having a host port and a plurality of device
  ports (The controller 40 of Fig. 1A (also Fig. 2, 200) serves as both the flash memory
  controller and a USB hub because it controls access to all memories on both the principle
  substrate and the daughter substrate; [0073-0079]);

- a male USB connector mounted on the drive substrate, connected by the wiring traces to
  the USB hub (Fig. 1A, 10; [0067]);

- a female connector mounted on the drive substrate, connected by the wiring traces to the
  USB hub (Fig. 1A, 20; The substrate 100 contains a stack connector 20 for connecting a
  slave board to the substrate [0073]);

- a flash controller mounted on the drive substrate, connected by the wiring traces to one of

  the plurality of device ports of the USB hub (The controller 40 of Fig. 1A (also Fig. 2,

  200) serves as both the flash memory controller and a USB hub because it controls access

  to all memories on both the principle substrate and the daughter substrate; [0073-0079]);

  and

- a flash memory mounted on the drive substrate, connected by the wiring traces to the

  flash controller, for storing data received by the USB hub through the host port (Fig. 1A,

  50; [0067]),

- whereby the drive substrate has mounted thereon the male USB connector, the female

  USB connector, the USB hub, the flash controller, and the flash memory (Fig. 1A).

Pua however fails to expressly disclose that stack connector 20 is a female USB connector.

Chen teaches a serially connectable USB drive that provides:

- a drive substrate having wiring traces for electrically connecting components (While

  Chen does not explicitly state that the various components of the USB drive of figures 1

  and 2 are mounted on a drive substrate having wiring traces for electrically connecting

  components there **must** inherently be wiring traces for electrically connecting

  components);

- a USB hub, mounted on the drive substrate, having a host port and a plurality of device

  ports (Fig. 2, item 2; [0015,0018-0019]);

- a male USB connector mounted on the drive substrate, connected by the wiring traces to the USB hub (Fig. 1 & 2, item 11; [0015-0016]);

- a female USB connector mounted on the drive substrate, connected by the wiring traces to the USB hub (Fig. 1 & 2, item 12; [0015-0016]);

- a flash controller mounted on the drive substrate, connected by the wiring traces to one of the plurality of device ports of the USB hub (Fig. 2, item 3; [0015-0018]); and

- a flash memory mounted on the drive substrate, connected by the wiring traces to the flash controller, for storing data received by the USB hub through the host port (Fig. 2, item 4; [0015-0019]),

whereby the drive substrate has mounted thereon the male USB connector, the female USB connector, the USB hub, the flash controller, and the flash memory ([0016]).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to implement the stack connector of Pua as a female USB connector as suggested by Chen such that a user may serially connect USB drives thus providing increased storage space and further providing an alternative way to use the old discarded USB drive effectively.

Regarding claim 2, the chainable USB flash-memory drive of claim 1 wherein the male USB connector connects to the host port of the USB hub; wherein the female USB connector connects to one of the plurality of device ports of the USB hub (Pua; The controller 40 of Fig. 1A (also Fig. 2, 200) serves as both the flash memory controller and a USB hub because it controls access to all memories on both the principle substrate and the daughter substrate; [0073-

0079]; Chen; Fig. 2 clearly shows the male port 11 connects to the USB HUB 2 and also clearly

shows the female port 12).

Regarding claim 3, the chainable USB flash-memory drive of claim 2 wherein the female USB

connector can connect to the male USB connector of a downstream chainable USB flash-

memory drive allowing a host connected to the male USB connector of the chainable USB flash-

memory drive to read flash memory from either the chainable USB flash-memory drive or from

the downstream chainable USB flash-memory drive, whereby the chainable USB flash-memory

drive can be daisy-chained to the downstream chainable USB flash-memory drive (Pua; [0073];

Chen; [0006, 0018-0020]).

Regarding claim 4, the chainable USB flash-memory drive of claim 3 further comprising: a

daughter-card that has a flash controller and a flash memory mounted thereon; a socket on the

drive substrate, the socket connected to one of the plurality of device ports of the USB hub by

the wiring traces; secondary connectors on the daughter-card for fitting into the socket on the

drive substrate, whereby expansion of flash memory is provided by the daughter-card (Chen

discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may

be serially connected thus providing infinitely many drive substrates connected to each other via

upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention

of Chen plugged into the downstream port 12 represents a daughter-card that has all of the

functional components of the PCB substrate).

Regarding claim 5, the chainable USB flash-memory drive of claim 4 wherein the secondary

connectors on the daughter-card comprise metal contact pads along a long edge or along a short

edge of the daughter-card, or comprise metal posts or a female connector plug (Fig. 1 of Chen

clearly shows USB (metal) contact pads on the short side of the USB drive for connecting to

metal contacts of other serially attached USB drives).

Regarding 6, the chainable USB flash-memory drive of claim 3 further comprising: a daughter-

card that has a flash memory mounted thereon (Pua; Fig. 1B; [0073]); an expansion flash

controller mounted on the drive substrate and connected to one of the plurality of device ports of

the USB hub by the wiring traces (Pua; The controller 40 of Fig. 1A (also Fig. 2, 200) serves as

the expansion flash memory controller and a USB hub because it controls access to all memories

on both the principle substrate and the daughter substrate; [0073-0079]); a socket on the drive

substrate, the socket connected to the expansion flash controller by the wiring traces (Pua; Fig.

1A; item 20 on the right of substrate 100); secondary connectors on the daughter-card for fitting

into the socket on the drive substrate (Pua; Fig. 1B; 110; [0073]), whereby expansion flash

memory is mounted on the daughter-card but the expansion flash controller is mounted on the

drive substrate (Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of

figures 1 and 2) may be serially connected thus providing infinitely many drive substrates

connected to each other via upstream and downstream ports 11 and 12. Therefore any secondary

USB drive of the invention of Chen plugged into the downstream port 12 represents a daughter-

card that has all of the functional components of the PCB substrate).

Regarding 7, the chainable USB flash-memory drive of claim 6 wherein the secondary connectors on the daughter-card comprise metal contact pads along a long edge or along a short edge of the daughter-card, or comprise metal posts or a female connector plug (Pua; A connector such as item 110 of Fig. 1B inherently possesses conductive metal contact pads in order to transfer data between the substrate and the extension memory; Fig. 1 of Chen clearly shows USB (metal) contact pads on the short side of the USB drive for connecting to metal contacts of other serially attached USB drives).

Regarding claim 9, the chainable USB flash-memory drive of claim 3 wherein the male USB connector and the female USB connector are mounted on opposite edges of the drive substrate (Pua; Fig. 1A; Chen discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be serially connected thus providing infinitely many drive substrates connected to each other via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention of Chen plugged into the downstream port 12 represents a daughter-card that has all of the functional components of the PCB substrate).

Regarding claim 10, a daisy-chainable flash card comprising:

- a printed-circuit board (PCB) substrate (Pua; Fig. 1A; 100; Chen Fig. 2);
- a hub controller mounted on the PCB substrate, the hub controller having a host port, a first device port, and a second device port, the hub controller forwarding commands and data to and from the host port and the first device port or the second device port (Pua;

The controller 40 of Fig. 1A (also Fig. 2, 200) serves as both the flash memory controller and a USB hub because it controls access to all memories on both the principle substrate and the daughter substrate; [0073-0079]; Chen [0015-0016]);

- a male connector mounted on the PCB substrate and connected to the host port of the hub controller for insertion into a female connector on a host (Pua; Fig. 1A, 10; [0067]; Chen; Fig. 1 & 2, item 11; [0015-0016]);

- a female connector mounted on the PCB substrate and connected to the first device port of the hub controller, for receiving a male connector on a downstream device (Pua; Fig. 1A, 50; [0067]; Chen; Fig. 1 & 2, item 12; [0015-0016]);

- a flash controller connected to the second device port of the hub controller (Pua; The controller 40 of Fig. 1A (also Fig. 2, 200) serves as both the flash memory controller and a USB hub because it controls access to all memories on both the principle substrate and the daughter substrate; [0073-0079]; Chen; Fig. 2, item 3; [0015-0018]); and

- a flash memory connected to the flash controller, for storing data from the host (Pua; Fig. 1A, 50; [0067]; Chen Fig. 2, item 4; [0015-0019]),

- wherein both the flash controller and the flash memory are mounted on a daughter-card;

- a socket on the PCB substrate for receiving a connector on the daughter-card,

- wherein the flash memory is connected to the flash controller which connects to the hub controller through the connector and the socket; (As stated above in the rejection under 35 U.S.C. 112 second paragraph the Examiner believes that applicant's intent is to claim that there exists a "flash controller" and "flash memory" on both the PCB substrate and the daughter-card, in other words the PCB substrate and daughter-card are identical

structures that serially connect to each other. Chen discloses [0006, 0015-0021] that

multiple USB drives (i.e. the invention of figures 1 and 2) may be serially connected thus

providing infinitely many drive substrates connected to each other via upstream and

downstream ports 11 and 12. Therefore any secondary USB drive of the invention of

Chen plugged into the downstream port 12 represents a daughter-card that has all of the

functional components of the PCB substrate)

- wherein the hub controller routes data from the host to the flash controller for storage by

   the flash memory when the host addresses local flash memory, but the hub controller

   routes data from the host to the female connector when the host does not address the local

   flash memory (Pua; Fig. 1A, 50; [0067]; [0145]; Chen; [0015-0021]).

Regarding claim 14, the daisy-chainable flash card of claim 10 wherein the male connector is a

male USB connector, the female connector is a female USB connector, and the hub controller is

a USB hub controller (Pua; [0067-0073]; Chen; [0015-0021]) .

Regarding claim 17, an expandable flash card comprising:

- substrate means for physically supporting and electrically connecting components

   mounted thereon (Pua; Fig. 1A,. 100; [0067]; Chen; Fig. 1 and 2);

- male protocol connector means, attached to the substrate means, for plugging into a

   female protocol connector on a host (Pua; Fig. 1A, 10; Chen; Fig. 1 &2, item 11; [0015-

   0016]);

- female protocol connector means, attached to the substrate means, for receiving a male protocol connector on a downstream device (Pua; Fig. 1A, 20; The substrate 100 contains a stack connector 20 for connecting a slave board to the substrate [0073]; Chen; Fig. 1 &2, item 12; [0015-0016]) ;

- protocol hub controller means, mounted on the substrate means, for routing protocol data from the host to an addressed port in a plurality of ports (Pua; The controller 40 of Fig. 1A (also Fig. 2, 200) serves as both the flash memory controller and a USB hub because it controls access to all memories on both the principle substrate and the daughter substrate; [0073-0079]; Chen; Fig. 2, item 2; [0015-0021]);

- first memory means, mounted on the substrate means, for storing the protocol data from the host when the host addresses a port on the protocol hub controller means for the first memory means (Pua; Fig. 1A, 50; [0067]; Chen; Fig. 2, item 4; [0015-0019]); and

- pass-through means for passing the protocol data from the host through to the female protocol connector means when the host addresses a port that is not in the plurality of ports of the protocol hub controller means, whereby protocol data is stored on the first memory means mounted on the substrate means, or is passed through from the male protocol connector means to the female protocol connector means (Pua; [0145]; Chen; [0015-0021]; Chen discloses that the switching circuit (i.e. USB Hub) functions as a USB Hub therefore passing signals through the substrate/daughter-card to the appropriate device).

Regarding claim 18, the expandable flash card of claim 17 wherein: when a protocol is a USB

protocol, the male protocol connector means is a male USB connector means, the female

protocol connector means is a female USB connector means, the protocol hub controller means

is a USB hub controller means, and the protocol data is USB data (Pua; [0067-0073]; Chen;

[0015-0016]).

Regarding claim 19, the expandable flash card of claim 18 further comprising: socket means,

connected to a second of the plurality of ports of the protocol hub controller means, for receiving

a daughter-card containing a second flash memory means for storing the protocol data from the

host when the host addresses a port on the protocol hub controller means for the second memory

means (Pua; Fig. 1A, 20; The substrate 100 contains a stack connector 20 for connecting a slave

board to the substrate [0073] thus providing unlimited memory expansion; [0145]; Chen

discloses [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may

be serially connected thus providing infinitely many drive substrates connected to each other via

upstream and downstream ports 11 and 12. Therefore any secondary USB drive of the invention

of Chen plugged into the downstream port 12 represents a daughter-card that has all of the

functional components of the PCB substrate.).

Regarding claim 20, the expandable flash card of claim 18 wherein the protocol hub controller

means further comprises address decode means for detecting and decoding protocol addresses

received from the host over protocol data lines (Pua; [0094-0103]; Chen; [006, 0019-0020];

Chen discloses that the switch circuit 2 of Fig. 2 acts as a USB Hub passing data to a standard

peripheral device inserted in the chain of serially connected USB drives. Therefore the switch

circuit (i.e. hub controller) **must** detect and decode addresses associated with peripheral devices

attached to the USB drive).

Regarding claim 21 Chen teaches,

The expandable flash card of claim 20 further comprising a downstream expandable flash card

that comprises:

- downstream substrate means for physically supporting and electrically connecting

  components mounted thereon (Chen discloses [0006, 0015-0021] that multiple USB

  drives (i.e. the invention of figures 1 and 2) may be serially connected thus providing

  infinitely many drive substrates connected to each other via upstream and downstream

  ports 11 and 12. Therefore any secondary USB drive of the invention of Chen plugged

  into the downstream port 12 represents a daughter-card that has all of the functional

  components of the PCB substrate.);

- downstream male protocol connector means, attached to the downstream substrate means,

  for plugging into the female protocol connector means (Fig. 2, item 11 plugs into item 12

  of an upstream USB drive [0015-0016]);

- downstream female protocol connector means, attached to the downstream substrate

  means, for receiving a male protocol connector on a further downstream device (Fig. 2,

  item 12 receives a downstream plug 11 from a serially connected USB drive);

- downstream protocol hub controller means, mounted on the downstream substrate means,

  for routing protocol data from the host to an addressed port in a second plurality of ports

([006, 0019-0020]; Chen discloses that the switch circuit 2 of Fig. 2 acts as a USB Hub

passing data to a standard peripheral device inserted in the chain of serially connected

USB drives. Therefore the switch circuit (i.e. hub controller) **must** detect and decode

addresses associated with peripheral devices attached to the USB drive);

- downstream first memory means, mounted on the downstream substrate means, for

   storing the protocol data from the host when the host addresses a port on the downstream

   protocol hub controller means for the downstream first memory means (Chen discloses

   [0006, 0015-0021] that multiple USB drives (i.e. the invention of figures 1 and 2) may be

   serially connected thus providing infinitely many drive substrates connected to each other

   via upstream and downstream ports 11 and 12. Therefore any secondary USB drive of

   the invention of Chen plugged into the downstream port 12 represents a daughter-card

   that has all of the functional components of the PCB substrate.); and

downstream pass-through means for passing the protocol data from the host through to the

downstream female protocol connector means when the host addresses a port that is not in the

second plurality of ports of the downstream hub controller means and is not in the plurality of

ports of the protocol hub controller means ([0015-0021]; Chen discloses that the switching

circuit (i.e. USB Hub) functions as a USB Hub therefore passing signals through the

substrate/daughter-card to the appropriate device), wherein the downstream expandable flash

card is removable from the expandable flash card (Chen discloses that the plurality of USB

drives are serially and removably connected [0015-0021]).

14.   Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pua in view of

Chen as applied to claim 3 above, and further in view of what was common knowledge to one of

ordinary skill in the art at the time of applicant's invention.

As noted above with respect to claim 3, Pua in view of Chen teaches a chainable USB flash

memory comprising a substrate (Fig. 1A) and a downstream expansion board (Fig. 1B). The

substrate contains the necessary hub and controller functions to access the memories of the

substrate and expansion modules. **OFFICIAL NOTICE** is taken that it was common

knowledge at the time of applicant's invention to implement a PCB as a multi-layer PCB in order

to provide more surface area for conductive wiring patterns as evidenced by Crepeau (US

4,249,302) (col. 2, ll. 37-54)..

15.   Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pua in view of

Chen as applied to claim 10 above, and further in view of the IEEE Standard for a High

Performance Serial Bus (i.e. IEEE1394 firewire).

As noted above with respect to claim 10, Pua in view of Chen teaches a chainable PCB USB

flash memory comprising a substrate (Fig. 1A) and a downstream expansion board (Fig. 1B).

The substrate contains the necessary hub and controller functions to access the memories of the

substrate and expansion modules [0067-0073] along with the necessary connectors to attach the

substrate to the host and the expansion memory modules. Neither Pua nor Chen however the

USB connectors (Fig. 1A, items 10 and 20) may also adhere to the IEEE-1394 firewire

specification.

The firewire specification teaches of a high-speed, low cost serial bus connection that provides:

a) Automatic assignment of node addresses—no need for address switches.

b) Variable speed data transmission based on ISDN-compatible1 bit rates from 24.576 Mbit/s for

TTL backplanes to 49.152 Mbit/s for BTL backplanes to 98.304 Mbit/s, 196.608 Mbit/s, and

393.216 Mbit/s for the cable medium.

c) The cable medium allows up to sixteen physical connections (cable hops), each up to 4.5 m,

giving a total cable distance of 72 m between any two devices. Bus management recognizes

smaller configurations to optimize performance.

d) Bus transactions that include both block and single quadlet reads and writes, as well as an

"isochronous" mode that provides a low-overhead guaranteed bandwidth service.

e) A physical layer supporting both cable media and backplane buses.

f) A fair bus access mechanism that guarantees all nodes equal access. The backplane

environment adds a priority mechanism, but one that ensures that nodes using the fair protocol

are still guaranteed at least partial access.

It would have been obvious to one of ordinary skill in the art at the time of the applicant's

invention to implement the USB connections as IEEE1394 firewire connections since IEEE1394

firewire has the added advantage of architectural compatibility with parallel computer buses; this

leads to lower communications overhead than limited function dedicated I/O interconnects

16.   Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's

admitted prior art as applied to claim 10 above, and further in view of Pua in view of Chen.

Applicant's admitted prior art (AAPA) teaches non-volatile flash memory is especially useful for

small consumer devices such as digital cameras, music players, personal digital assistants, etc

[0002]. Typically these flash memories are used to expand the storage capacity of a personal

computer (or previously listed applications) [0003]. These flash memories adhere to several well

known connection standards including secure-digital, memory-stick, or compact flash [0003].

However, applicant admits that one shortcoming of such flash memories is the limited capacity

of internal flash memory chips [0006]. Applicant then admits that what is needed is an

expandable flash-memory drive.

As noted above with respect to claim 10, Pua in view of Chen teaches an expandable flash-

memory substrate (Pua; Fig. 1A, 100; Chen; Fig. 1 and 2) that comprises a male connector (Pua;

Fig. 1A, 10 or the item 20 on the left; Chen Fig. 2, 11), a female connector (Pua; Fig. 1A, item

20 on the right; Chen; Fig. 2, 12), a flash memory controller, and a hub controller (Pua; Fig. 1A,

40; where the controller 40 serves as both the flash memory and a hub since the controller

controls commands and data between the USB host and manages data in the flash memory

[0069]; Chen Fig. 2, 2; [0015, 0018-0019]). Pua also teaches that slave boards (Pua; Fig. 1B,

150) may be connected to the substrate 100 for extending the memory size of the substrate by the

incorporation of additional flash chips (Pua; Fig. 1B, 120; [0073]; Chen; [0007-0008, 0021]).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's

invention to implement the expandable flash memory of Pua in view of Chen into a standard

flash memory as set forth in AAPA (i.e. secure-digital, memory-stick, or compact flash) such

that the user is provided with a flash memory having unlimited memory expansion (Pua;

[00073]).

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Ryan M. Stiglic whose telephone number is 571.272.3641. The

examiner can normally be reached on Monday - Friday (6:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Rehana Perveen can be reached on 571.272.3676. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PAUL R. MYERS
PRIMARY EXAMINER